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Subject Info on radiation risks at low doses, comparison to NRC

Winston, et al:
With our recent efforts on trying to understand radiation risk/dose, EPA vs other Federal or State approaches, I have attempted to pull together some articles and notes regarding such to clarify and explain why EPA's approach is not 'outside the norm' or 'too conservative' -- even though some radionuclides like radium can be more difficult due to its inherent higher natural background, with corresponding ARARs that can be outside EPA's risk range when extrapolated to dose rates, for example. Nevertheless, other federal agencies, like the Nuclear Reg. Commission [NRC], can have higher dose standards, but can have more restrictive cleanup policies [see NCRP146 summary attached]. Note NRC also has the '5 pCi/g' in its regs also.

Below is Owen Hoffman's summary of some of these articles attached, as well his direct reply to ATSDR's approach to radiation criteria, MRLs and screening. This was from email correspondence between he and ATSDR/CDC. I agree with him that 'a' should be their approach to be consistent with their approach with chemical carcinogens. This was Elmer Akin's view when I took over his role as laision to the Oak Ridge Health Effects sub-committee as well.

In our 'soundbite age' it is difficult to explain fully radiation risks/doses/differences among other agencies, and I know most of you do not have time to read all of the articles, so I've attempted to summarize the NCRP146 report and the paper on Low-Level Radiation [Brenner paper], attached, and I will put a copy of all of this in your inbox[s]. Take a quick look at the representing international & national groups, organizations of the co-authors of the Brenner paper, includes Puskin from EPA ORIA. And as reminder, ICRP is the international radiation science body that puts together guidance & recommendations from groups like the NAS BEIR, UNSCEAR, and others, and in turn, most nations have a NCRP-type group that adopts/adds to ICRP for specific national guidances/recommendations.

The Low-level radiation paper [Brenner] concludes that the linear non-threshold is still appropriate for determining radiation risks: "a linear extrapolation of cancer risks from intermediate to very low doses currently appears to be the most appropriate methodology. This linearity assumption is not necessarily the most conservative approach, and it is likely that it will result in an underestimate of some radiation-induced cancer risks and an overestimate of others." And this paper looks at all the current research from Atomic Bomb survivors, medical practices, and even hormesis studies

From Owen Hoffman, former ORNL risk assessor, now with consulting firm, and member of EPA's Science Advisory Board:

I believe however, that the ATSDR cancer screening dose for ionizing radiation confuses two very different concepts:
(a) a dose sufficiently low that the excess risk can be considered negligible with respect to public health protection, and
(b) a dose sufficiently high that it is at or near the level at which the dose response (i.e. risk) can be detected in an epidemiological study.

I believe that the ATSDR screening limits for radiogenic cancer should be based on (a) above, not (b). In fact, I do not think that concept (b) above is applied by ATSDR as a cancer screening level for any other known human carcinogen, other than for ionizing radiation.

The articles by Brenner et al. (2003) and the ICRP 12/421/04 both consider the presence of risk below the limits of epidemiological detection. The ICRP draft demonstrates the importance of applying quantitative

uncertainty analysis in estimating radiogenic cancer risks at low doses and low dose rates, and provides extensive descriptions of the biological mechanisms of action at low doses.

I consider the authors of this PNAS paper to be among the most respected in the professions of radiation epidemiology, radiation biology, public health, and biostatistics. This paper makes the distinction between the lowest doses at which radiogenic cancer risks are directly measureable with epidemiology techniques and risks that are present and real, but are below levels at which a statistically significant dose response in human populations can be detected.

The PNAS paper discusses situations in which a linear no-threshold dose response may over-estimate true risks, or conversely, underestimate these risks. Brenner et al. essentially support the linear no-threshold model as being not inconsistent with the weight of evidence of radiobiological and cytogenetic data, without leading to large over-estimation of risk at low doses and low dose rates. Details of the biological mechanisms of action are described.

Another publication that may be of interest to you and ATSDR is the ICRP Committee 1 Task Group Report 12/421/04 of December 10, 2004 on Low-dose Extrapolation of Radiation-Related Cencer Risk. Dr. Land is the chairman of this Task Group. This draft ICRP report is available for public comment from the ICRP at its web site http://www.icrp.org/draft_cancer.asp. Many of the authors of this ICRP draft report were co-authors with Brenner in the PNAS article that is attached to this e-mail. The ICRP draft document follows up on the NCI/CDC publication by Land et. al. of 2003 regarding the quantification of radiogenic cancer risks at low doses that I sent you earlier. This report addresses the risk of radiogenic cancer at low doses and low dose rates and advocates quantative uncertainty analysis in risk estimation at exposure levels below the limits of epidemiogical detection. It discusses the effect of possible threshold effects on the quantification of uncertainty in the dose response.

I believe both the PNAS paper and the draft report of the ICRP demonstrate the merit of issues that I and others have raised with ATSDR in the past regarding ATSDR screening levels for public exposures to radiation and the risk of radiogenic cancer, and the need for quantification of uncertainty when estimating risks at low doses.

I hope you find these publications to be of interest.

Sincerely,

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BrennerPNAS2003.pdf


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